

Message Text

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APPROVED BY ACDA/NTB:RWBUCHHEIM

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OSD:TGEORGE/RSQUIRE

ERDA:RDUFF S/S:MR BRIDGES

OES/NET:DJENKINS

PM/DCA:HPHELPS

CIA:TFROSCHER

JCS:CWILMOT

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TO USMISSION IAEA VIENNA

UNCLAS STATE 270452

E.O. 11652: N/A

TAGS: TECH, IAEA, UR, US, PARM

SUBJECT: IAEA FIFTH PNE TECHNICAL COMMITTEE MEETING

NOV. 22-26, 1976

REFS: (A) IAEA VIENNA 6902; (B) IAEA VIENNA 7049

1. LISTED BELOW ARE AVAILABLE NAMES AND ADDRESSES OF U.S. PARTICIPANTS FOR SUBJECT MEETING. MISSION SHOULD RECOMMEND DELEGATION HEAD AS U.S. MEMBER OF COMMITTEE; OTHERS SHOULD BE NOMINATED AS OBSERVERS TO MEETING. MISSION MAY INVOLVE STAFF MEMBERS AS OBSERVERS AT ITS DISCRETION.

(A) A. J. HODGES, DELEGATION HEAD

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U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION;
WASHINGTON, D.C. 20545.

(B) J. H. TAYLOR

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION;
WASHINGTON, D.C. 20545.

(C) R. K. SQUIRE

OFFICE OF THE SECRETARY OF DEFENSE; INTERNATIONAL SECURITY
AFFAIRS; WASHINGTON, D.C. 20301.

(D) F. S. HOUCK

U.S. ARMS CONTROL AND DISARMAMENT AGENCY; WASHINGTON, D.C.
20451.

(E) REPRESENTATIVE OF DEPARTMENT OF STATE (TO BE NAMED
LATER).

(F) A. HOLZER

UNIVERSITY OF CALIFORNIA; LAWRENCE LIVERMORE LABORATORY;
P. O. BOX 808; LIVERMORE, CALIFORNIA 94550.

(G) L. B. BALLOU

UNIVERSITY OF CALIFORNIA; LAWRENCE LIVERMORE LABORATORY;
P. O. BOX 808; LIVERMORE, CALIFORNIA 94550.

(H) M. D. NORDYKE

UNIVERSITY OF CALIFORNIA; LAWRENCE LIVERMORE LABORATORY;
P. O. BOX 808; LIVERMORE, CALIFORNIA 94550.

(I) D. R. WESTERVELT

UNIVERSITY OF CALIFORNIA; LOS ALAMOS SCIENTIFIC
LABORATORY; P. O. BOX 1663; LOS ALAMOS, NEW MEXICO 87545.
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2. FOLLOWING PARAGRAPHS CONTAIN ABSTRACTS OF PAPERS
INTENDED FOR PRESENTATION AT MEETING, WHICH MISSION SHOULD
SUBMIT TO IAEA SECRETARIAT PURSUANT TO ZHELUDEV'S LETTER
OF 20 AUGUST 1976.

3. TITLE: PROJECT RIO BLANCO -- ADDITIONAL PRODUCTION
TESTING AND RESERVOIR ANALYSIS

AUTHOR: L. B. BALLOU; LAWRENCE LIVERMORE LABORATORY;
UNIVERSITY OF CALIFORNIA; LIVERMORE, CALIFORNIA

ABSTRACT

ADDITIONAL SUBSURFACE INVESTIGATIONS OF THE
RIO BLANCO DETONATION REGION AND ADJACENT RESERVOIR HAVE
BEEN UNDERWAY SINCE THE LAST TECHNICAL MEETING AT IAEA.

THE LOWERMOST EXPLOSION CAVITY HAS BEEN REENTERED AND A
PRODUCTION TEST FROM IT WAS PERFORMED. A DRY GAS VOLUME
OF $7.6 \times 10^{10}(\text{EXP5})\text{M}(\text{EXP3})$ (27 MMSCF) WAS WITHDRAWN.
CHEMICAL AND RADIOCHEMICAL ANALYSES OF THIS GAS SHOW THAT
A) THE YIELD OF THE BOTTOM EXPLOSIVE WAS 31 PLUS OR
MINUS 2 KT; B) THE CAVITY/CHIMNEY VOLUME WAS $2.4 \times 10^{10}(\text{EXP4})\text{M}(\text{EXP3})$ ($8.4 \times 10^{10}(\text{EXP5})\text{FT}(\text{EXP3})$); C) ABOUT 7 OF
THE TRITIUM PRODUCED IS ASSOCIATED WITH THE GAS; AND D)
A SLIGHT (APPROXIMATELY 0.1) GAS CONTRIBUTION FROM THE
MIDDLE EXPLOSION REGION WAS NOTED. THE RESERVOIR/CHIMNEY
MODEL IMPLIES AN UNSTIMULATED RESERVOIR FLOW CAPACITY OF
0.15 MDARCY-M (0.50 MD-FT) CONNECTED TO THE BOTTOM
CHIMNEY REGION. A CAVITY RADIUS OF 21 PLUS OR MINUS 3 M
(70 PLUS OR MINUS 10 FT) WAS DEDUCED.

UNSTIMULATED RESERVOIR PRODUCTION PARAMETERS WERE
INVESTIGATED IN A WELL OFFSET 190 M (625 FEET) FROM THE
EMPLACEMENT HOLE. INSUFFICIENT PRODUCTIVITY WAS OBTAINED
IN THE MESAVERDE FORMATION (IN WHICH THE BOTTOM EXPLOSIVE
WAS DETONATED) TO EVALUATE RESERVOIR PROPERTIES. THE
PRODUCTIVE SANDSTONES IN THE FORT UNION FORMATION ADJOIN-
ING THE TOP DETONATION REGION WERE INDIVIDUALLY EVALUATED.
THEIR AGGREGATE FLOW CAPACITY WAS DETERMINED TO BE
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0.14 PLUS OR MINUS .02 MDARCY-M (0.45 PLUS OR MINUS 0.08
MD-FT). A NUMERICAL SIMULATION MODEL WHICH INCORPORATES
THESE DATA IS DESCRIBED.

THE LACK OF A HIGH-PERMEABILITY CONNECTION BETWEEN THE
THREE EXPLOSION REGIONS REMAINS UNEXPLAINED.

THE TWO CHIMNEY REENTRY WELLS HAVE BEEN CEMENTED TO THE
SURFACE AND ABANDONED. THE OFFSET WELL HAS BEEN PLUGGED
IN A WAY WHICH PRESERVES THE OPTION FOR ADDITIONAL SUB-
SURFACE INVESTIGATION IN THE FUTURE. PROJECT FACILITIES
HAVE BEEN REMOVED AND THE SITE HAS BEEN RESTORED TO CON-
DITIONS WHICH MINIMIZE ENVIRONMENTAL IMPACT.

4. TITLE: MEASUREMENT OF AN EQUATION-OF-STATE POINT FOR

MOLYBDENUM AT VERY HIGH PRESSURE

AUTHORS: C. E. RAGAN III, M. G. SILBERT, AND
B. C. DIVEN; LOS ALAMOS SCIENTIFIC LABORATORY; UNIVERSITY
OF CALIFORNIA; LOS ALAMOS, NEW MEXICO 87545

ABSTRACT

THE LOS ALAMOS SCIENTIFIC LABORATORY HAS CONDUCTED A
VARIETY OF SCIENTIFIC EXPERIMENTS ASSOCIATED WITH NUCLEAR
EXPLOSIONS. NUCLEAR PHYSICS EXPERIMENTS HAVE BEEN

ESPECIALLY WELL EXPLOITED IN THE PAST AND HAVE BEEN
REPORTED AT AN EARLIER PNE MEETING. A RECENT SCIENTIFIC
INVESTIGATION USING NUCLEAR EXPLOSIONS INVOLVED THE
DEVELOPMENT OF A METHOD TO MEASURE EQUATION-OF-STATE
PROPERTIES OF MATERIALS BEHIND STRONG SHOCKS. A SHOCK WAS
GENERATED BY RAPIDLY FISSION HEATING A SLAB OF 235U BY
EXPLOSING IT TO NEUTRONS AT ABOUT 1 M FROM A NUCLEAR
EXPLOSION AND ALLOWING IT TO EXPAND INTO AN ADJACENT
SAMPLE OF THE MATERIAL TO BE STUDIED. A POINT ON THE
MOLYBDENUM EQUATION OF STATE WAS DETERMINED AT A PRESSURE
OF 2.0 TPA (20 MBAR) BY MEASURING DIRECTLY BOTH THE
SHOCK VELOCITY AND THE PARTICLE VELOCITY BEHIND THE SHOCK.
THE SHOCK VELOCITY WAS OBTAINED BY DETERMINING THE TRANSIT
TIME OF THE PLANAR SHOCK BETWEEN POSITIONS AT TWO DEPTHS
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IN THE MOLYBDENUM. THIS TIME INTERVAL WAS DETERMINED BY
OBSERVING THE LIGHT FLASHES PRODUCED WHEN THE SHOCK
REACHED FREE SURFACES LOCATED AT THE TWO DEPTHS. THE
PARTICLE VELOCITY WAS OBTAINED BY OBSERVING THE DOPPLER
SHIFTS OF SIX NEUTRON RESONANCES IN THE NEUTRON ENERGY
REGION FROM 200 TO 800 EV IN THE MOVING, SHOCKED
MOLYBDENUM. THE PRESSURE AND DENSITY DERIVED FROM THIS
PAIR OF VELOCITY MEASUREMENTS, MADE TO AN ACCURACY OF
PLUS OR MINUS 5 , ARE 20 MBAR AND 24.8 G-CM (EXP-3),
RESPECTIVELY. THIS EXPERIMENT REPRESENTS THE FIRST
DIRECT DETERMINATION OF A POINT ON THE HUGONIOT OF ANY
MATERIAL IN THIS PRESSURE REGION, AND THE RESULTING DATA
POINT IS IN GOOD AGREEMENT WITH THEORETICAL ESTIMATES.
THIS MEASUREMENT WAS A SUCCESSFUL DEMONSTRATION THAT THE
DOPPLER SHIFT TECHNIQUE CAN BE USED TO OBTAIN PARTICLE
VELOCITIES UNDER THESE CONDITIONS. IT APPEARS THAT ERRORS
IN BOTH THE SHOCK VELOCITY AND THE PARTICLE VELOCITY
COULD BE REDUCED TO APPROXIMATELY PLUS OR MINUS 2 IN AN
IMPROVED MEASUREMENT, RESULTING IN A WELL-DEFINED
HUGONIOT FOR MOLYBDENUM, WHICH CAN BE USED AS A STANDARD
IN FUTURE IMPEDANCE-MATCHING EXPERIMENTS.

5. TITLE: GROUND MOTION AND BUILDING DAMAGE FROM
UNDERGROUND NUCLEAR DETONATIONS

AUTHOR: FRED HOLZER; LAWRENCE LIVERMORE LABORATORY;
UNIVERSITY OF CALIFORNIA; LIVERMORE, CALIFORNIA

ABSTRACT

FOLLOWING THE RULISON DETONATION (43 KT AT 2570M), THE
DAMAGE SUSTAINED BY HOUSES IN THE COMMUNITIES SURROUNDING
THAT EXPERIMENT SHOWED A MARKED CORRELATION WITH THE
ACCELERATION SPECTRUM IN THE .05 TO .2 SEC PERIOD RANGE.
THIS CORRESPONDENCE WAS USED TO PREDICT THE DAMAGE FROM

THE RIO BLANCO EXPERIMENT (THREE 30 KT EXPLOSIVES
DETONATED SIMULTANEOUSLY AT DEPTHS OF 1780, 1900, AND
2040 METERS). DATA FROM RIO BLANCO AGREE SUBSTANTIALLY
WITH PREDICTIONS, AND HAVE BEEN USED TO EXTEND THE RANGE
OF THE MOTION-DAMAGE CORRELATION. SINCE RIO BLANCO CAUSED
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DAMAGE TO ONLY 66 BUILDINGS IN COMMUNITIES WHERE GROUND
MOTIONS WERE MEASURED (COMPARED TO 167 FOR RULISON),
STATISTICS ARE POOR, AND THE DATA SHOW CONSIDERABLE
SCATTER. NEVERTHELESS, WITH THE AID OF DATA FROM EXPLO-
SIONS AT THE NEVADA TEST SITE, THE DAMAGE CORRELATION
CURVE CAN NOW BE EXTENDED TO MOTIONS EQUIVALENT TO THE
LIMIT OF PERCEPTION.

THE RIO BLANCO DATA ALSO GIVE ADDITIONAL CONFIDENCE IN
THE GROUND MOTION PREDICTION PROCEDURE WHICH SCALES BOTH
YIELD AND DEPTH OF BURIAL. THE METHOD SHOWS THAT PEAK
ACCELERATIONS INCREASE WITH BOTH YIELD AND DEPTH, AND
RESPONSE SPECTRA FOR DEEPER EXPLOSIONS ARE ENHANCED IN
THE DAMAGE-CAUSING FREQUENCY INTERVAL. MOTIONS FROM
GASBUGGY, RULISON, AND RIO BLANCO--ALL DETONATED IN
SEDIMENTARY BASINS--ARE ESSENTIALLY CONSISTENT WITH THIS
THEORY. CONVERSELY, DETONATIONS AT SHALLOW DEPTHS AND
IN MORE COMPACTIBLE MEDIA SUCH AS ALLUVIUM WOULD TEND TO
CAUSE LOWER-AMPLITUDE ACCELERATIONS.

6. FYI. TWO FURTHER PAPERS AND FURTHER OBSERVER
NOMINEES ARE UNDER CONSIDERATION. END FYI. KISSINGER

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